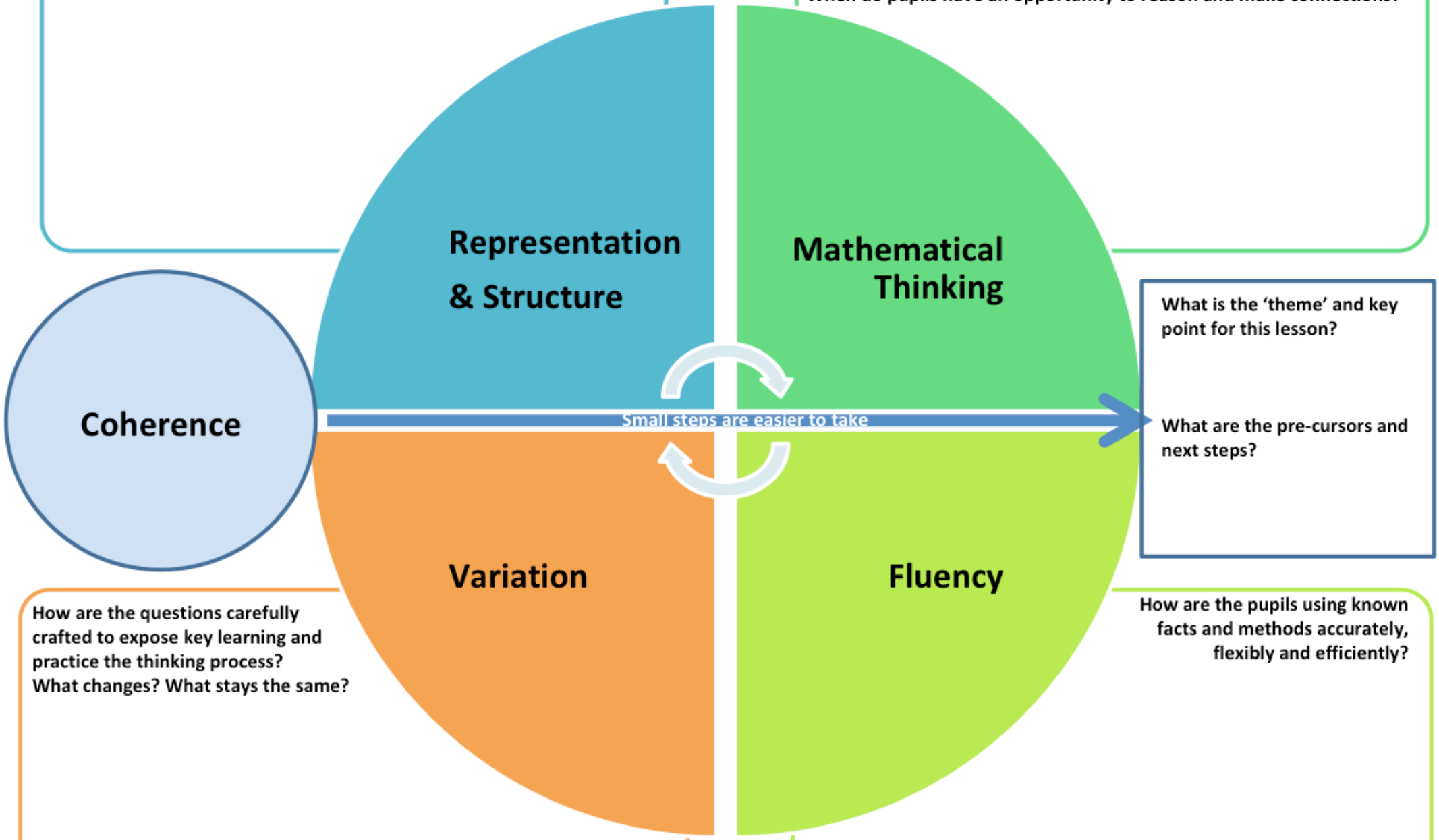
Teaching for Mastery

How is the mathematics represented and the structure exposed?

What are the pupils working on, thinking about, discussing, reasoning?
When do pupils have an opportunity to reason and make connections?



What is the 'theme' and key point for this lesson?

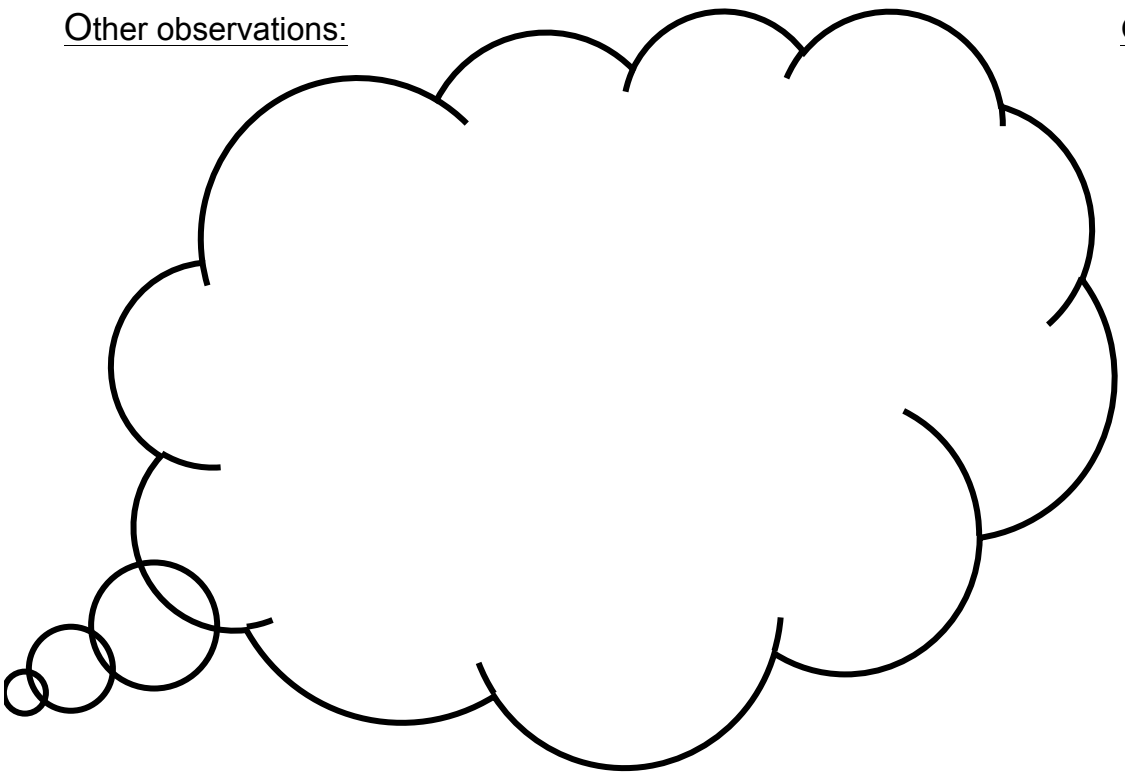
What are the pre-cursors and next steps?

How are the questions carefully crafted to expose key learning and practice the thinking process?
What changes? What stays the same?

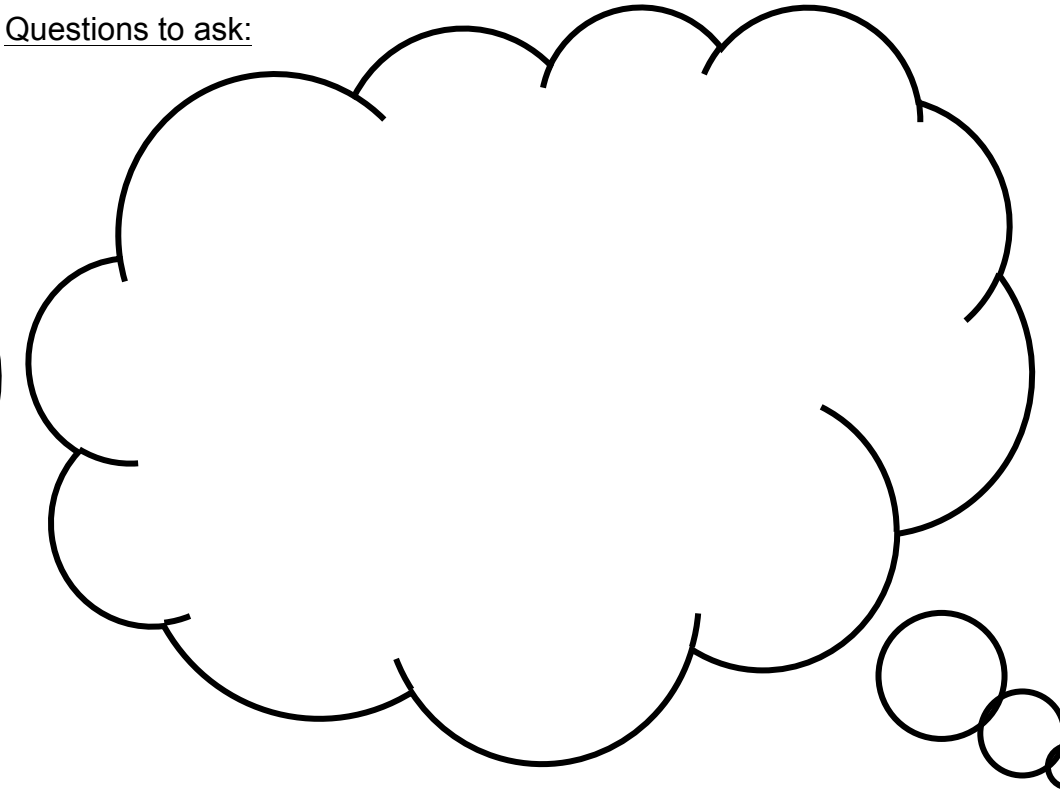
How are the pupils using known facts and methods accurately, flexibly and efficiently?

	Key Messages	Notes/Examples
Coherence	1. Small steps are easier to take. 2. **Focusing on one key point each lesson** allows for deep and sustainable learning. 3. Certain images, techniques and concepts are **important pre-cursors** to later ideas. Getting the sequencing of these right is an important skill in planning and teaching for mastery. 4. When introducing new ideas, it is important to make connections with earlier ones that have already been understood. 5. When something has been deeply understood and mastered, it can and should be **used in the next steps of learning**.	
Variation	1. The central idea of teaching with variation is to **highlight the essential features of a concept or idea** through varying the non-essential features. 2. **Variation is not the same as variety** – careful attention needs to be paid to what aspects are being varied (and what is not being varied) and for what purpose. 3. When giving examples of a mathematical concept, it is useful to add variation to emphasise: a. **What it is (both standard and non-standard examples**); b. **What it is not**. 4. When constructing a set of activities or questions it is important to consider what connects the examples; what mathematical structures are being highlighted? Students are encouraged to avoid mechanical practice and, instead, **to practice the thinking process (intelligent practice)**	
Representation & Structure	1. The representation needs to clearly show the concept being taught, and in particular the key difficulty point. **It exposes the structure**. 2. In the end, the **students need to be able to do the maths without the representation** 3. A stem sentence describes the representation and helps the students move to working in the abstract ("ten tenths is equivalent to one whole") and could be seen as a representation in itself 4. There will be some key representations which the students will meet time and again 5. **Pattern and structure are related but different**: Students may have seen a pattern without understanding the structure which causes that pattern	
Fluency	1. **Fluency demands more of students than memorisation** of a single procedure or collection of facts. It encompasses **a mixture of efficiency, accuracy and flexibilit**y. 2. Quick and efficient recall of facts and procedures is important in order for students to keep track of sub-problems, think strategically and solve problems. 3. Fluency also demands the **flexibility to move between different contexts and representations of mathematics**, to recognise relationships and make connections and to make appropriate choices from a whole toolkit of methods, strategies and approaches.	
Mathematical Thinking	1. Mathematical thinking is central to deep and sustainable learning of mathematics. 2. Taught ideas that are understood deeply are **not just 'received' passively but worked on by the student**. They need to be thought about, reasoned with and discussed. 3. Mathematical thinking involves: a. looking for **pattern** in order to discern **structure**; b. looking for **relationships** and **connecting ideas**; c. **reasoning logically**, **explaining**, **conjecturing** and **proving**.	

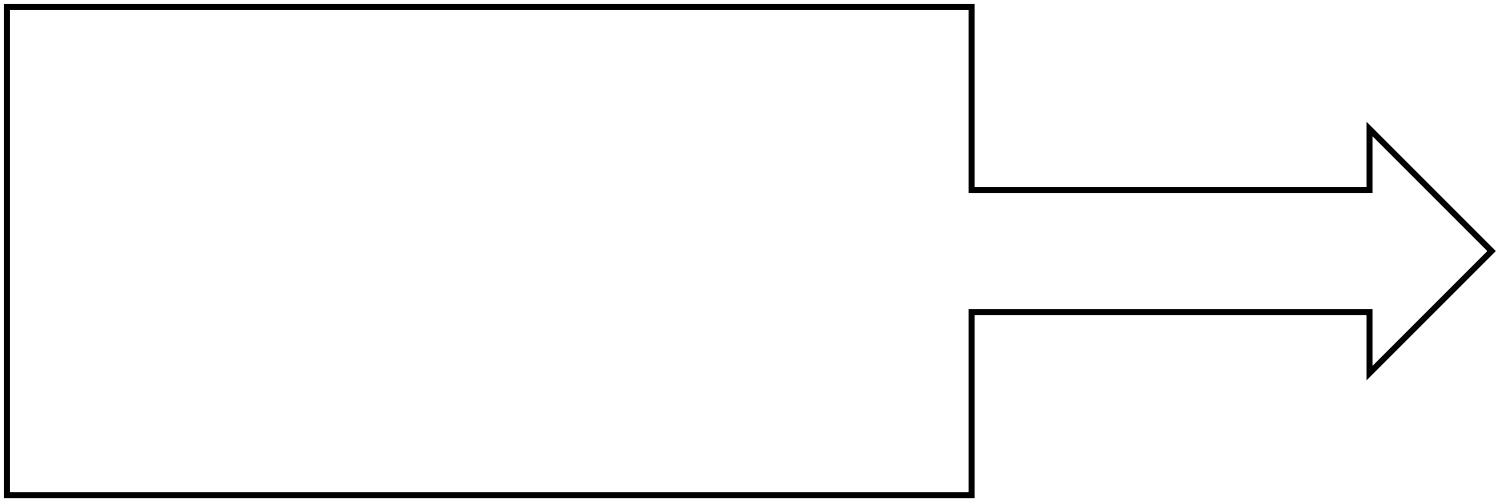
Other observations:



Questions to ask:



Strategies /Ideas / Techniques I will try as a result of today's lesson:



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MathsHUBS

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